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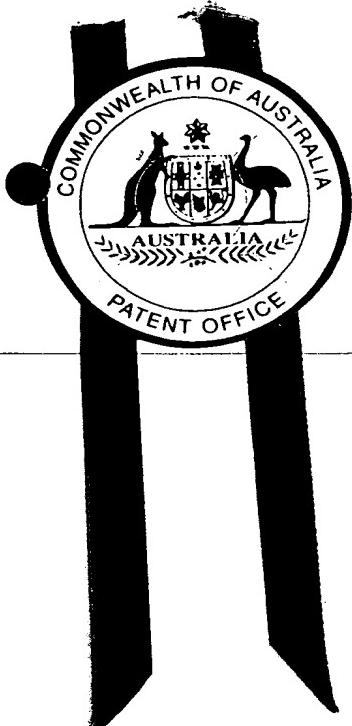


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I, KIM MARSHALL, MANAGER PATENT OPERATIONS hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PP 8057 for a patent by BARTLEM PTY LTD filed on 07 January 1999.



WITNESS my hand this  
Eleventh day of October 1999

KIM MARSHALL  
MANAGER-PATENT OPERATIONS

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"A SHREDDER/CLEANER"

This invention relates to shredder/cleaners and in particular shredder/cleaners for garden use.

Rotary processing devices such as rotary mowers and  
5 shredders are utilised to process long fibrous articles such as palm fronds, long grass and tree refuse and during processing, it is common for the material to become entangled about the drive shaft of the rotary processor. This entanglement can build up to such extent that it jams the  
10 machine and prevents further operation thereof or substantially reduces the efficiency of operation of the processor.

In some instances such entanglement about a drive shaft can damage seals and the like which extend about that drive  
15 shaft. Any build up of such refuse is also undesirable in instances where air flow paths are established in the rotary processor as those airflow paths may be significantly reduced by buildup about the drive shaft.

Rotary processors such as garden refuse shredders often  
20 have difficulty dealing with the wide variety of refuse such as leaves and or other small articles and large articles such as palm fronds.

Shredders are often used in a preliminary operation to rid an area of large garden refuse whereafter the area is  
25 tidied either by trimming and raking or sweeping with a blower. Thus it is common for a home owner or garden

contractor to provide individual implements for performing these operations. Typically blowers are hand held and powered by electric or petrol motors. This imposes a weight limitation which limits the power of the blowers.

5       This invention aims to provide improved shredder/cleaners.

In one aspect this invention resides broadly in a shredder/cleaner having:-

a refuse inlet for refuse to be shredded;  
10      an outlet for shredded refuse;  
air flow creating means for creating an outflow of air through the outlet, and  
adaptor means associated with a flexible hose and connectible to the outlet whereby the air flow discharged  
15      through the outlet may be directed through the flexible hose.

The outlet may also be formed for attachment of a catcher thereto whereby a user may optionally connect a catcher to the outlet for catching shredded refuse or connect the flexible hose thereto when the shredder is operated in a non-shredding mode. In this mode it is preferred that the  
20      hose be provided with a discharge nozzle for providing the discharged air as a fast directional stream of air. The hose may also be used, if desired, when shredding so as to discharge the shredded refuse and in such circumstances an open hose would preferably be used to prevent blocking of the  
25      hose.

The air flow creating means could induce incoming air through the housing for the shredding apparatus. Suitably however the air flow creating means induces an air flow through the inlet which is suitably adapted for fitting a 5 vacuum hose thereto so that the shredder/cleaner may also be used as a vacuum cleaner for removing refuse such as leaves and the like.

Suitably the air flow is along an expanding travel path from the inlet and passing to the outlet and more suitably 10 this travel path includes or is in the form of a volute or the like.

In one form of the invention, the shredder/cleaner includes a refuse shredder in the form of a rotary processing apparatus having a drive shaft driving a shredder disc 15 mounted within a housing containing the inlet for refuse to be shredded and the outlet for discharging shredded refuse and the shredder disc is provided with vanes for creating the desired air flow.

Suitably the shredder disc assembly suitably includes a 20 relatively heavy disc supporting chipper blades thereon above apertures therethrough through which shredded refuse may pass to be discharged. The impeller means may be separate from the shredder disc assembly but suitably the impeller means is provided by vanes supported on the shredder disc assembly.

25 In order that this invention may be more readily understood and put into practical effect, reference will now

be made to the accompanying drawings which illustrate a typical embodiment of the invention and wherein:-

Fig. 1 is a side view of the shredder/cleaner fitted with a catcher;

5 Fig. 2 is corresponding view but shown without a catcher;

Fig. 3 illustrates the shredder/cleaner disposed in a servicing mode;

10 Fig. 4 is a part-sectional view of the rotor and its mounting;

Fig. 5 is a cutaway plan view of the rotor assembly;

FIGS. 6 and 7 illustrates in plan and side sectional views another embodiment of the rotor assembly;

15 FIGS. 8 and 9 illustrates in plan and side sectional views a further embodiment of the rotor assembly and its mounting details;

FIG. 10 is a detailed view of the barrier means of the embodiment illustrated in Fig. 9 for preventing entwinement about the drive shaft;

20 FIG. 11 is an exploded view of the rotor assembly of Fig. 9 and its mounting details;

FIG. 12 is an exploded view of the shredder/cleaner according to the Fig. 9 embodiment;

25 FIG. 13 illustrates the shredder/cleaner illustrated in Fig. 12 opened for accessing the rotor assembly, and

FIG. 14 illustrates a vacuum cleaning attachment for the

embodiments illustrates in Fig. 1 and/or Fig. 9.

The garden shredder/cleaner 10 illustrated in the drawings has a two-part housing 11 supported on rear wheels 12 and a front stand 13, a hopper assembly 14 and a small bore inlet pipe 15 extending upwardly from the upper housing part 16. The shredder/cleaner 10 is illustrated with a blower 18 suspended from the front of the housing 11. A catcher 17, shown dotted, may also be suspended from the front of the housing 11 to catch shredded material exhausted through the outlet from the housing. The housing 11 contains a rotary chipper assembly 20, illustrated in Fig. 4, and supports a small petrol motor 21 thereabove for driving the rotary chipper assembly 20.

The blower 18 has a transition housing 26 removably attached to the outlet chute from the housing 11. The transition housing 26 converges to a tubular outlet pipe 34 to which a flexible hose and nozzle assembly 39 may be connected. The nozzle 42 is associated with a handle 43 for manipulation by a user.

Opposed pin hinges 22 attach the upper housing part 16 to the lower housing part 19 at the rear thereof which enable the upper housing part 16 and the components mounted thereon to fold to an open position, as illustrated in Fig. 3, at which the handle 24 rests on the ground and clear access is provided to the rotary chipper assembly 20 through the open underside of the top housing part 16. The front of the top

housing part 16 is retained on the lower housing part 19 by bolts 25.

As illustrated in Figs. 4 and 5, the rotary chipper assembly 20 has a disc-like rotor 28 formed with opposed 5 radially extending slots 27 at diametrically opposite positions and a chipper blade 30 bolted to the rotor 28 adjacent the trailing side of each slot 27.

Macerator blocks 29 are interposed between the blades 30 and are fixed to the rotor 28 with inner ends spaced from the 10 hub 31 to which the rotor 28 is bolted. A pin 32 extends down from the end wall 33 of the upper housing part 16 toward the rotor 28 and is positioned between the hub 31 and the macerator blocks 29.

The hub 31 is formed at the lower end of a thick-walled 15 sleeve 35 which is bored to accept the output shaft 36 of the motor 21 which is keyed thereto by a key in conventional manner. The lower end of the motor shaft 36 is threaded to receive a retaining bolt 37 which pulls the rotor 28 against the end of the shaft 36. The rotor is also bolted to the hub 20 31 by bolts 38.

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The sleeve 35 is supported by a large capacity self-aligning cam-lock bearing 40 which is secured to the end wall 33 through a stiffening boss 41. This bearing is locked to the motor shaft 36 so as to support the weight of and end 25 thrust placed upon the rotor 28.

The bearing 40 also accommodates the side and impact

loads imparted by the operation of the chipper blades 30. This isolates undesirable loads being applied to the crankshaft of the directly mounted motor 21 which is supported on a channel shaped mounting 23 fixed to the end 5 wall 33. For this purpose the rotor 28 is relatively heavy so as to act as a flywheel. In this embodiment the rotor 28 is 5mm thick steel plate.

The underside of the rotor 28 has impeller blades 44 bolted thereto so as to create an air flow through the open 10 front 45 of the housing 11. This induces a downdraught through the hopper assembly 14 and the small bore inlet pipe 15 which assists in feeding material to be mulched therethrough toward the rotor 28.

The induced draught also throws shredded material 15 through the outlet which is normally closed by a flap 47 hinged along its upper edge and pivotable upwardly to permit a conventional lawn mower grass catcher 50 to be removably clipped to the housing 11 to receive the shredded material. Typically the grass catcher 17 is interchangeable with the 20 grass catcher from a domestic rotary mower.

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It will be seen that the hopper assembly 14 has a forwardly convergent transition piece 51 extending from its underside to the inlet aperture formed in the top wall 33, while the inlet pipe 15 is angled back to assist feeding of 25 the material being fed therethrough toward the rotor 28.

In use when the rotor 28 is rotated at high speed, air

is induced to flow through the hopper 14 and inlet pipe 15, which may be capped if desired. This air flow assists in the feeding of material to be shredded to the rotor 28. Most of this matter will be shredded by the chipper blades 30 and 5 pass through the apertures 27 for discharge to the catcher.

Should leafy material or stringy material move across the top of the rotor 28 toward the hub 31 it will be contacted by the macerator blocks 29 and be pulverised.

These blocks cooperate with the pin 32 to prevent long 10 lengths of material reaching the hub 31 and becoming entwined therearound.

In the event that the chipper blades need servicing, they can be access easily by releasing the bolts 25 and pivoting the top housing part to its open position as 15 illustrated in Fig. 3. In this position the rotor 28 is stably supported for safe working conditions. An inlet safety flap 48 is pivotally attached to the upper end of the hopper to substantially close the hopper after the addition of material to be shredded but providing an opening or 20 leaving a gap thereabout for maintenance of an air flow therethrough to assist with the feeding and/or discharge process.

This arrangement provides a shredder of very simple form which has the bulk of its weight centralised between the 25 wheels 12 and the stand 13 for stable operation. The weight of the hopper is offset by the catcher and the handle 24

provides for simple balanced wheeling of the shredder 10 from location to location and support for the opened housing.

The rotary chipper assembly 55 illustrated in Figs. 6 and 7 has opposed blades 56 formed with upturned cutting ends 57 at their inner ends, the blades 56 being bolted to the rotor 58. A complementary arcuate blade 59 centered on the rotor axis is fixed to the end wall 60 of the upper housing part and is located close to the upturned ends 57 as they rotate thereby to cut up long strands of matter which may be fed toward the boss 62. This prevents such long strands from winding about the boss and possibly entering the bearing seal of its supporting bearing.

The rotary chipper assembly 60 illustrated in Figs. 8 to 13 has opposed blades 61 formed with upturned cutting or disrupting ends 62 which are shaped to pass closely about the end face 63 and side face 64 of the bolts 65 which bolt the end wall 66 to the heavy housing of the cam-lock nearing 67. In order that the ends 62 pass close to the bolts 65 they are high tensile cap screws which have relatively deep cylindrical heads so that their angular adjustment will not vary the required close spacing. The blades 61 are bolted to the rotor 69.

An annular barrier wall 70 extends down from the end wall 66 to terminate closely adjacent the rotor 69 and about the hub assembly 71 which is carried by the cam-lock bearing 67. This hub is keyed to the drive shaft 73 of the motor 74

and a central retaining bolt extends through the rotor 69 into the shaft 73.

As can be clearly seen in Fig. 10, when the blades 61 are in line with one of the bolts 65 the only path 5 thereacross to the hub assembly 71 is a circuitous or labyrinth path passing as per the arrow 75, being first about the side and end face of the bolts 65 and then past the barrier wall 70. This will provide an effective barrier against elongate fibrous articles entwining about the shaft. 10 Material which travels inward beyond the chipper blades 76 will be resisted by the barrier wall 70 where it will be cut up or disrupted and then forced outwardly either by the motion of the rotor or the air flow across the rotor 69. The through bolts for the chipper blades 76 also secure the 15 impeller blades 77 to the rotor 69.

Fig. 12 illustrates the simple and easy to manufacture nature of the shredding apparatus, being formed mostly of folded sheet metal bolted together and punched for bolt on mounting of the components such as the motor and bearing 20 assembly, while Fig. 13 illustrates the ease of servicing the working components which are normally concealed within the rotor housing. Fig. 12 illustrates the comparative sizes and locations of the relatively small pipe inlet at the base of the inlet pipe 80 and the relatively large part-circular 25 chute inlet 79.

Referring to Fig. 14 it will be seen that the inlet pipe

80 is provided with a pivoted closure flap 81 which normally falls down to a position at which it closes the pipe 80, thus assisting in maintaining a relatively high air flow through the inlet chute 14 to assist flow of refuse to the chipper 5 blades. A coupling 82 at the end of a flexible hose 83 is provided with an external sealing ring 84 and it plugs into the upper end of the pipe 80. The outer end of the hose 83 terminates in a suction nozzle and handle assembly such as is illustrated diagrammatically at 85.

10 Blocking means may also be provided for the partially open inlet chute to assist in creating a suitable vacuum effect at the nozzle 85.

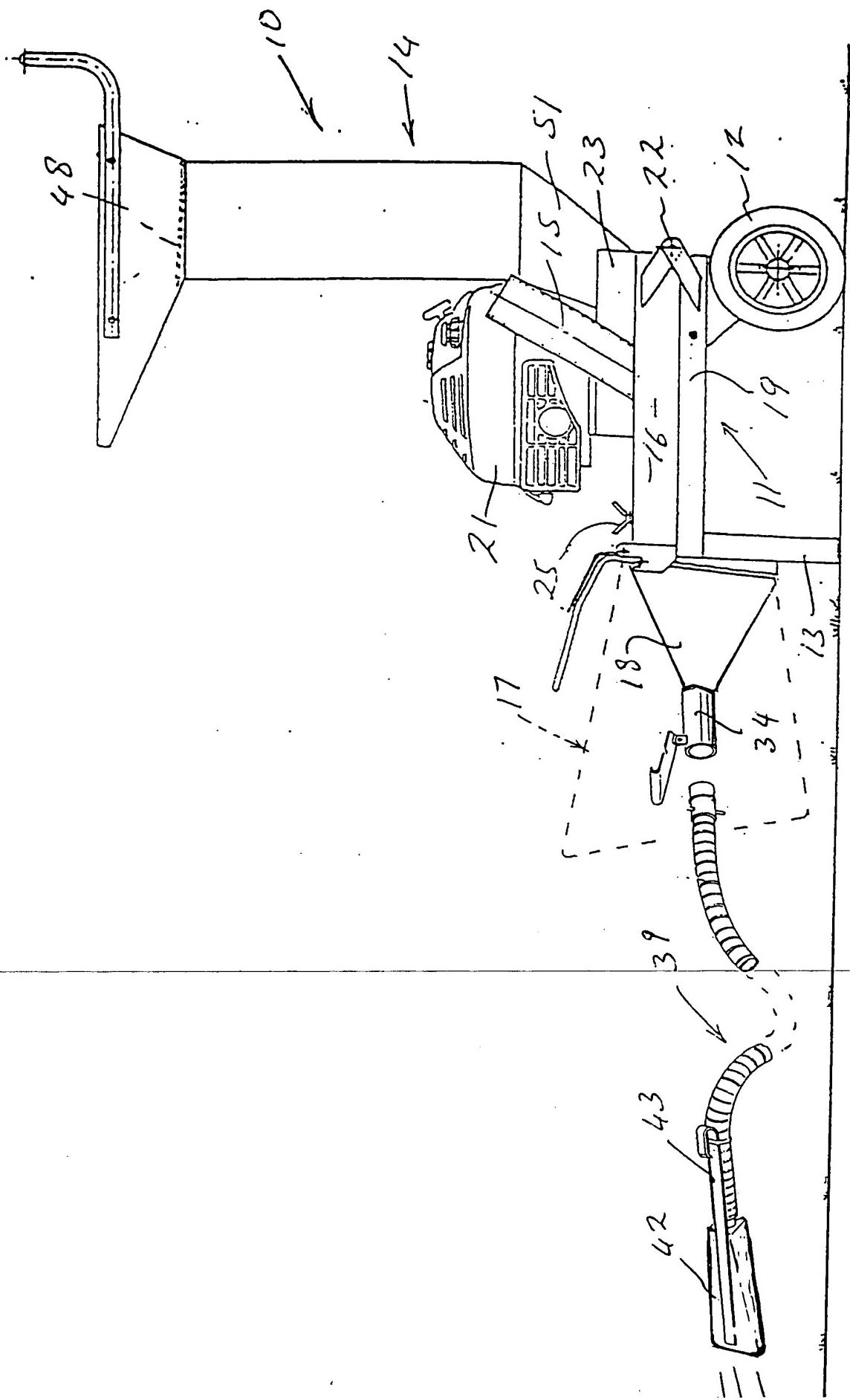
It will of course be understood that the above has been given by way of illustrative example of the present invention 15 and that all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as is herein set forth.

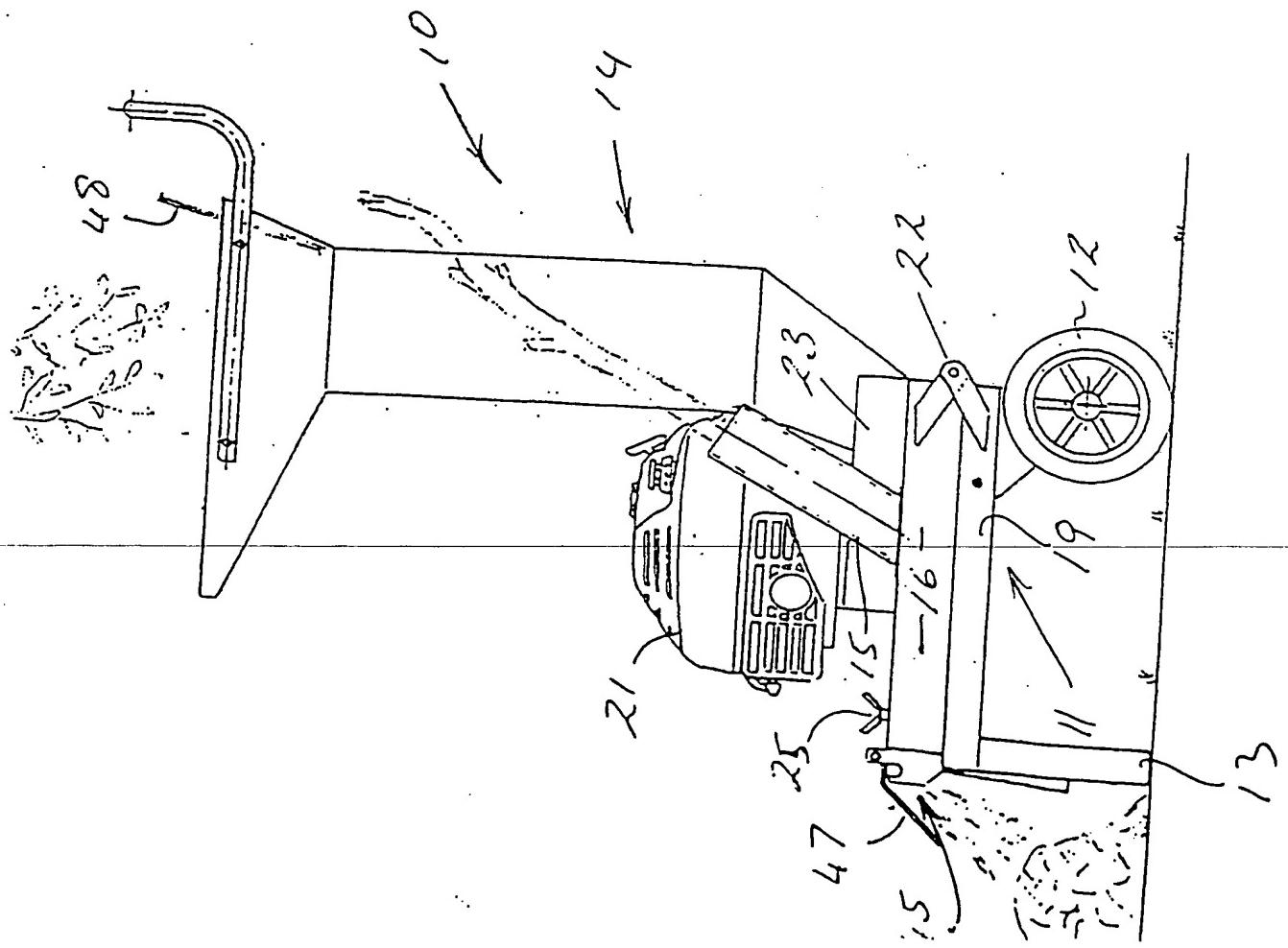
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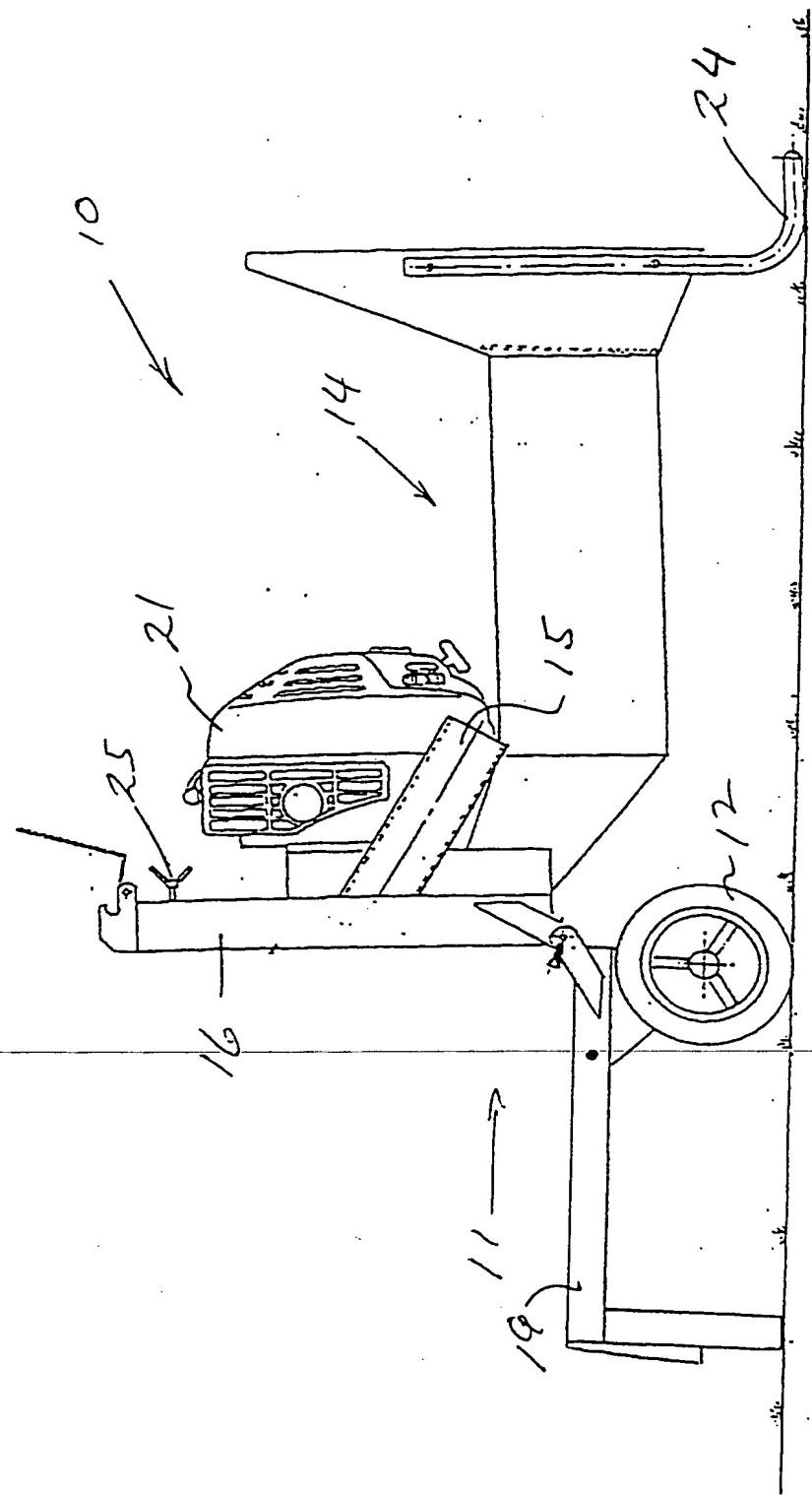


Fig. 3

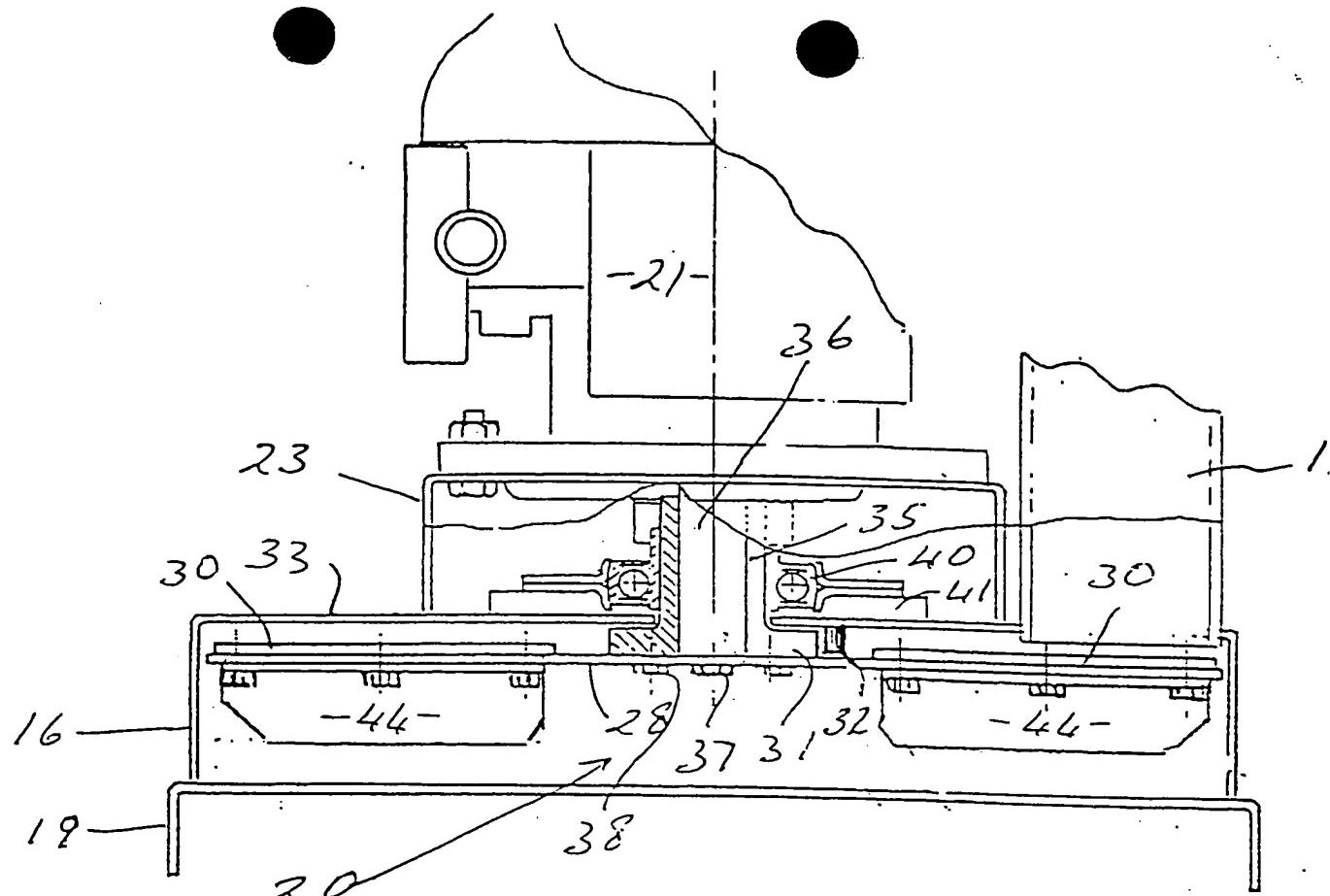


Fig. 4.

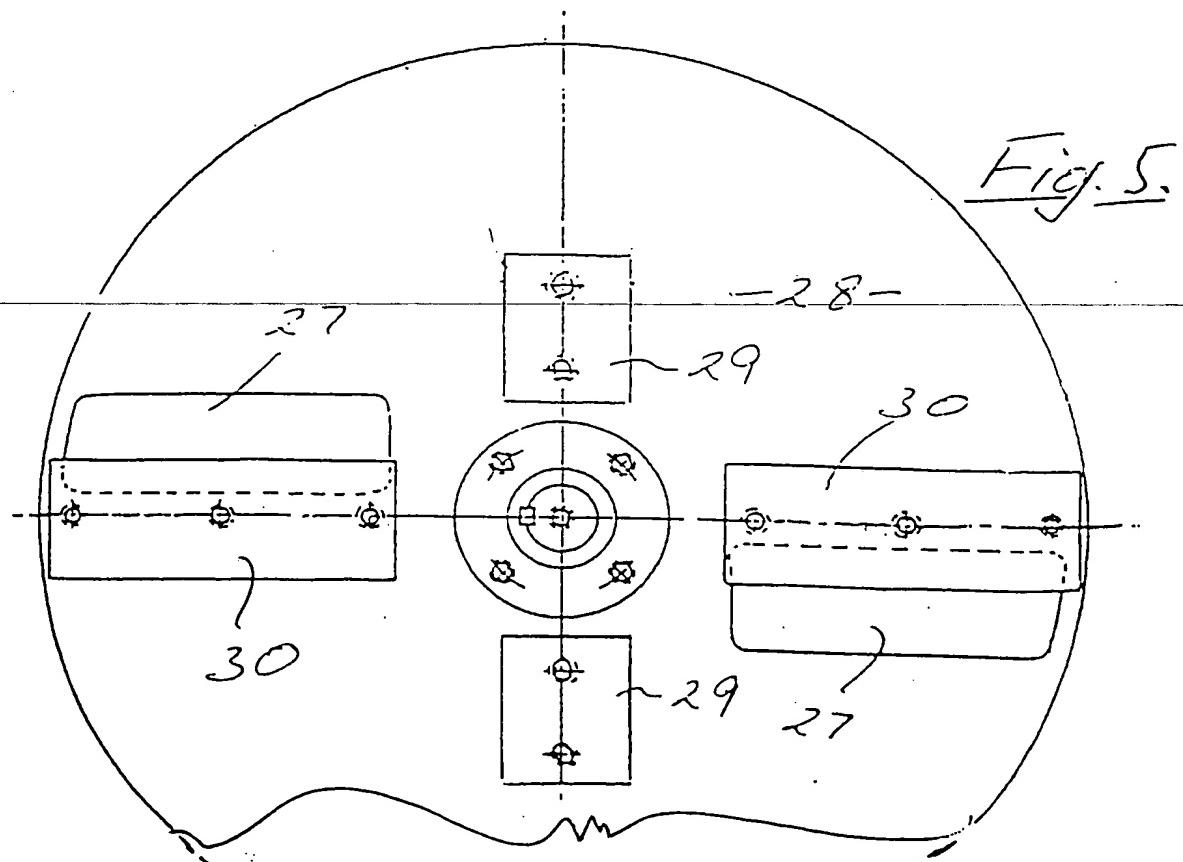


Fig. 5.

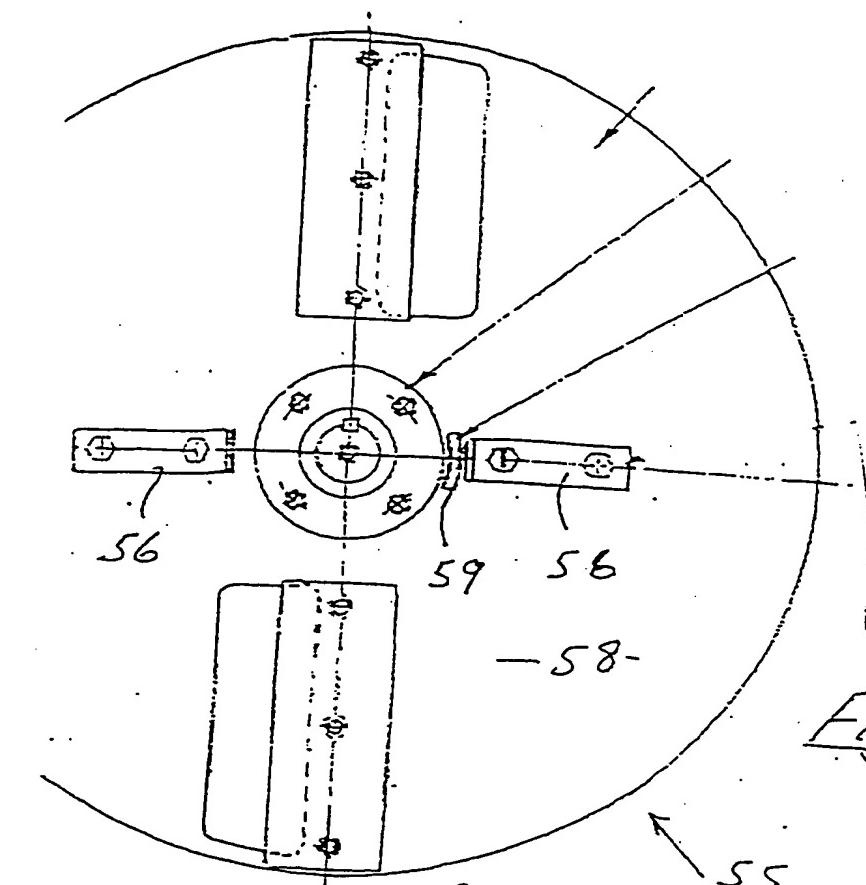


Fig. 6

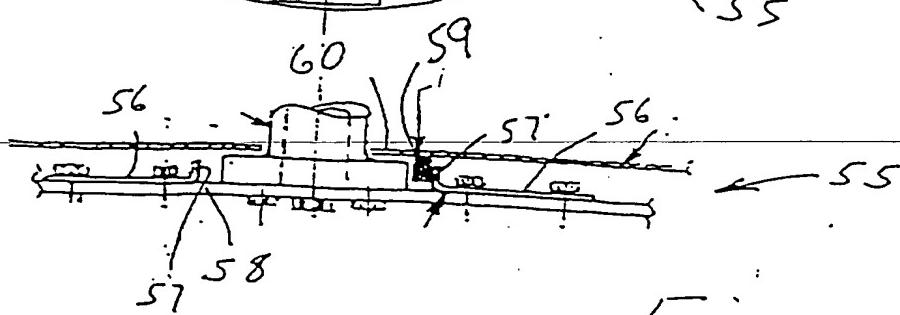
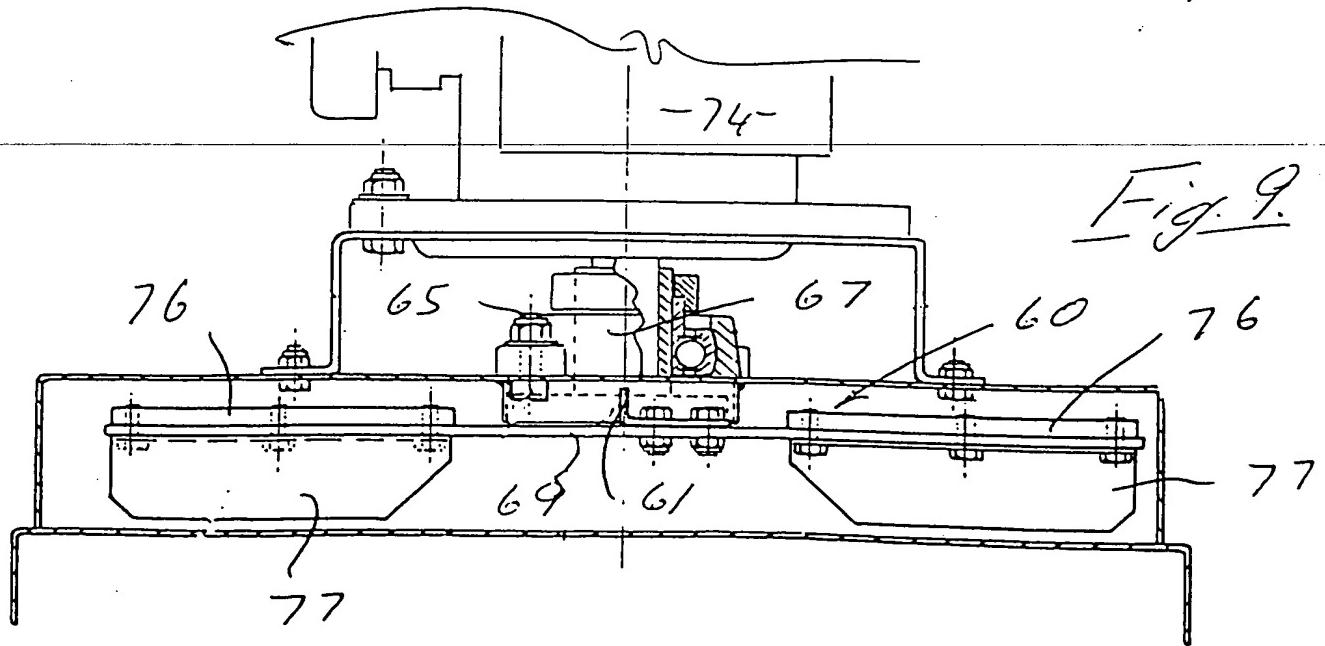
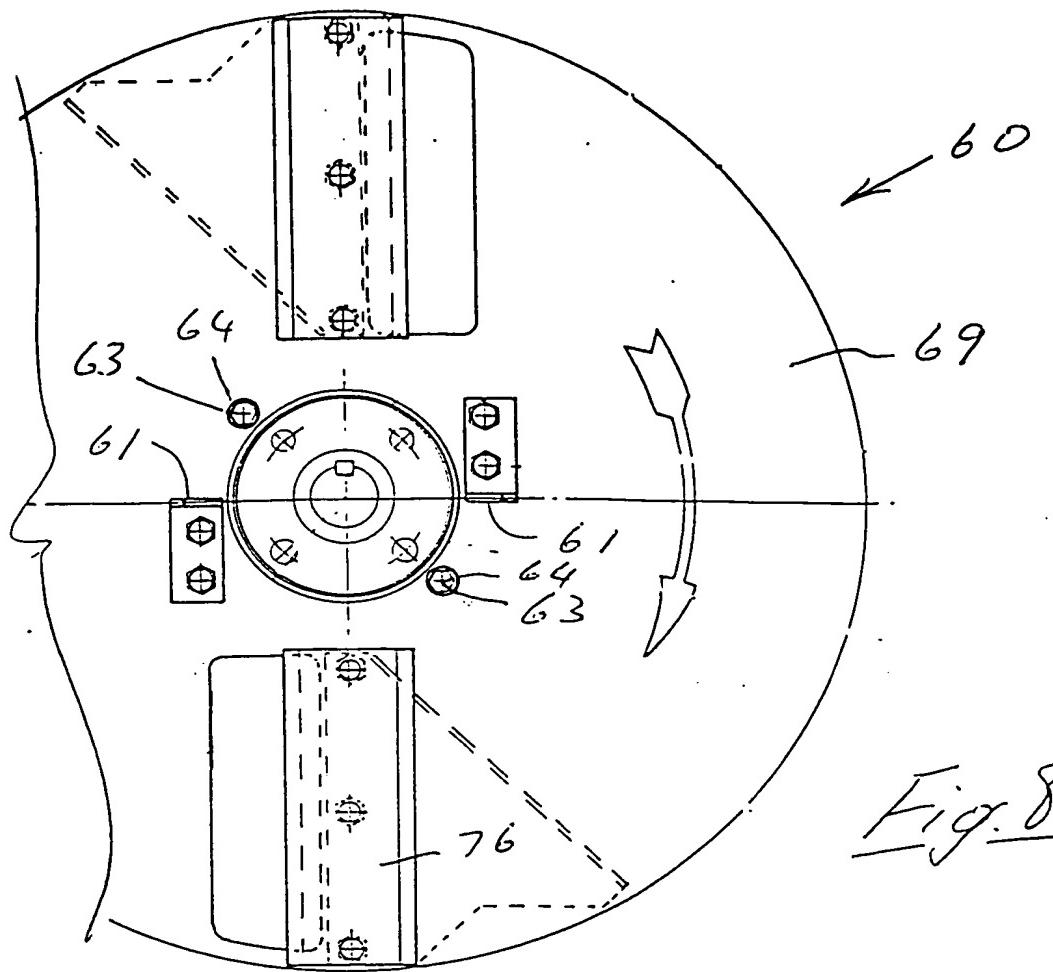


Fig. 7



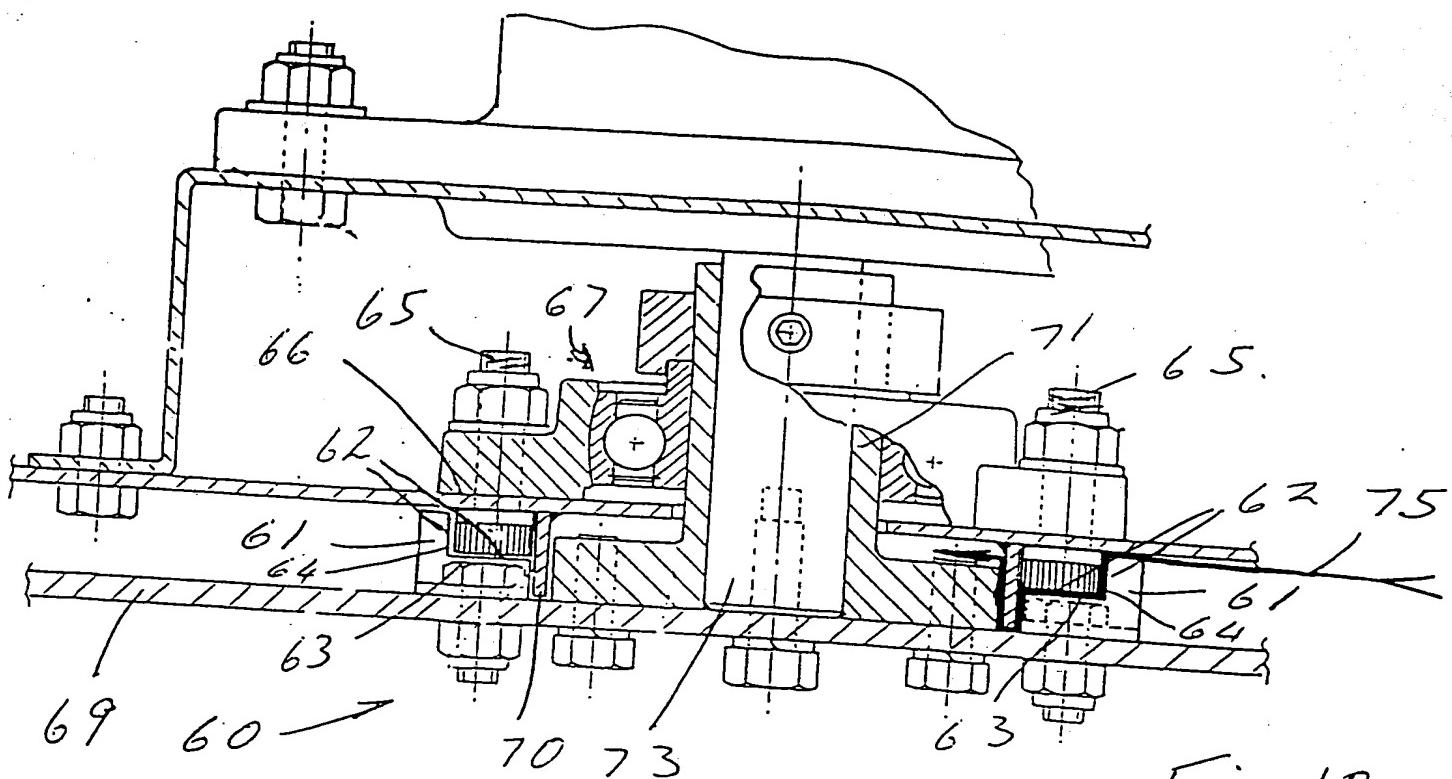


Fig. 10

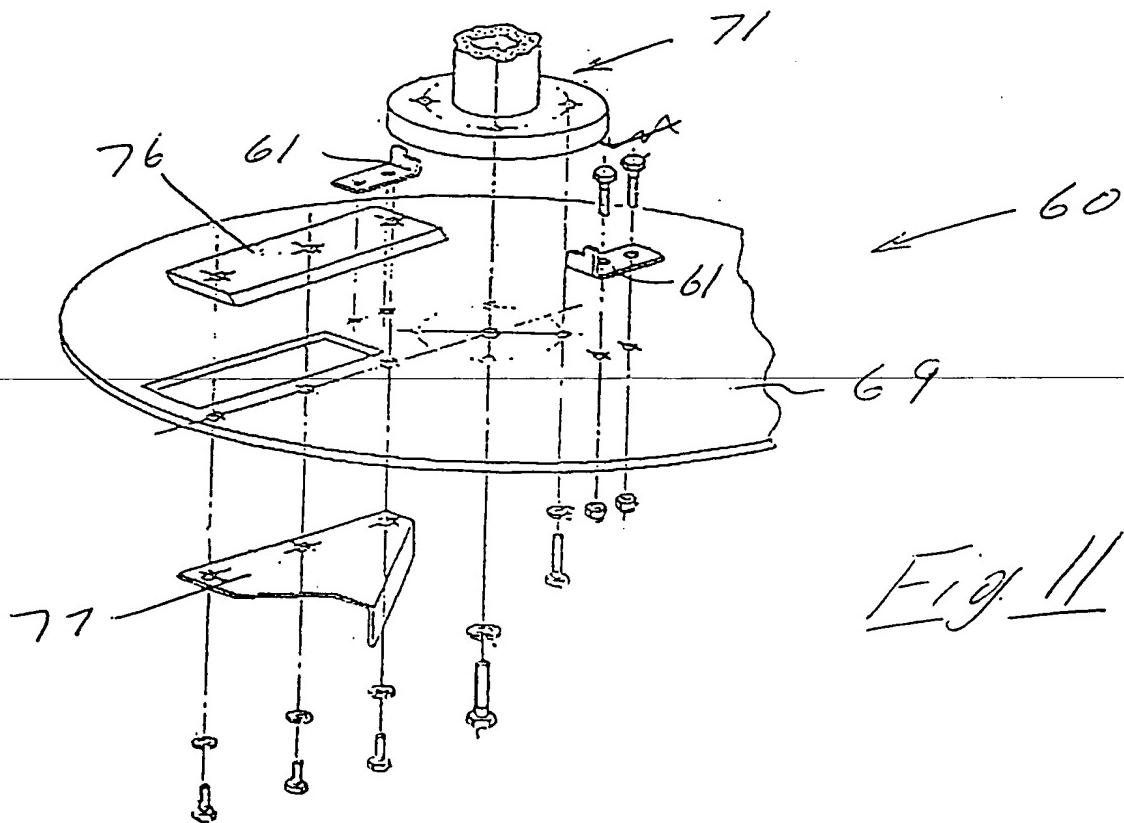


Fig. 11

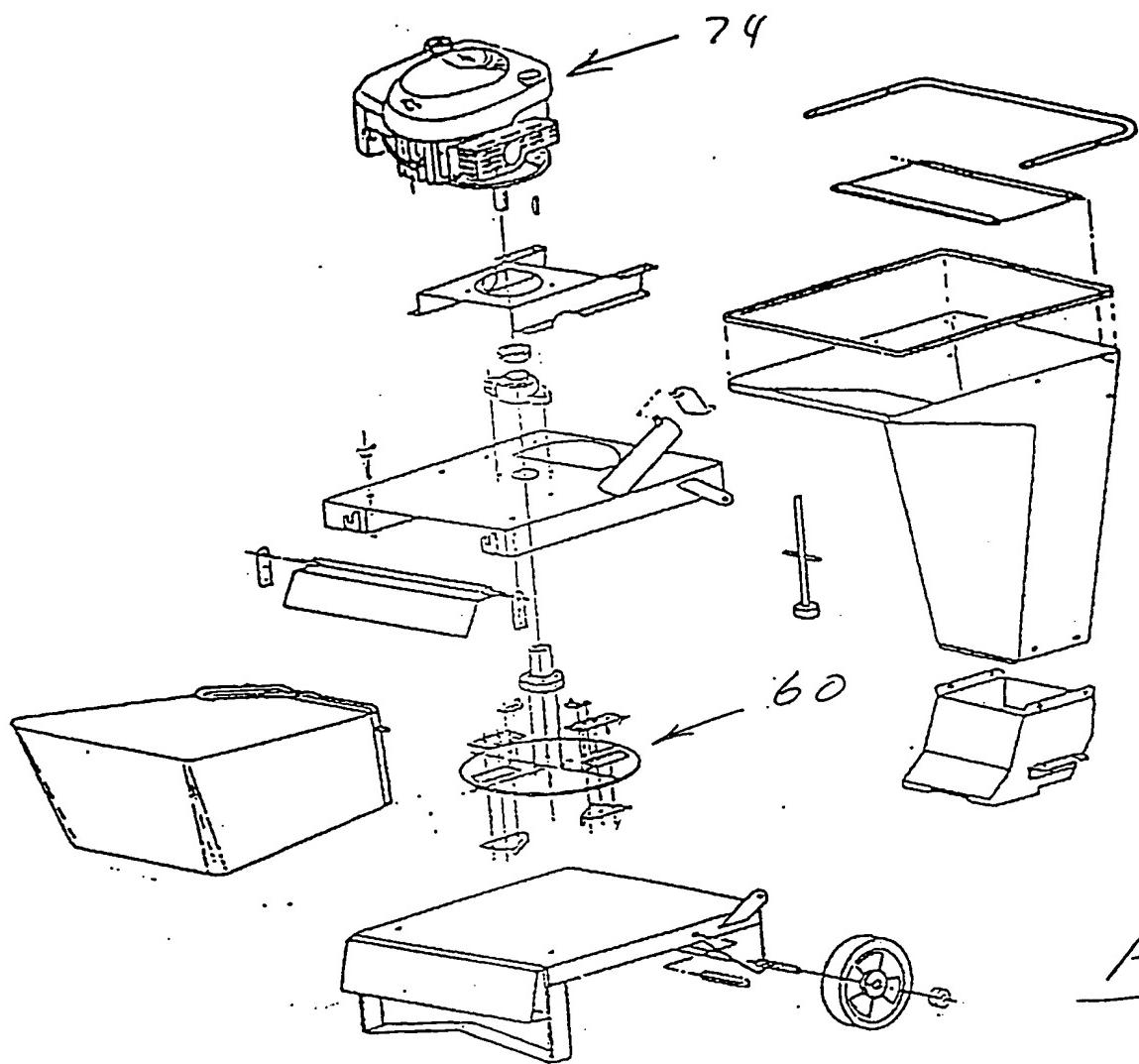


Fig. 12

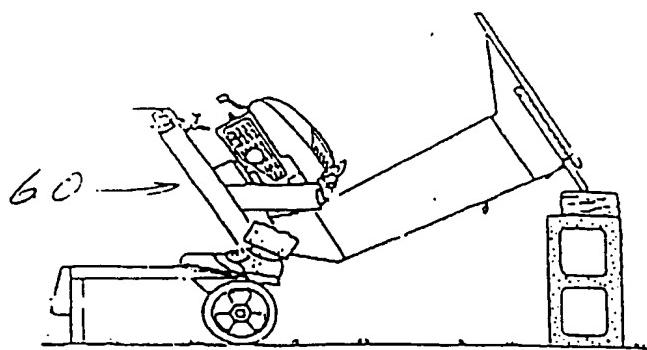


Fig. 13

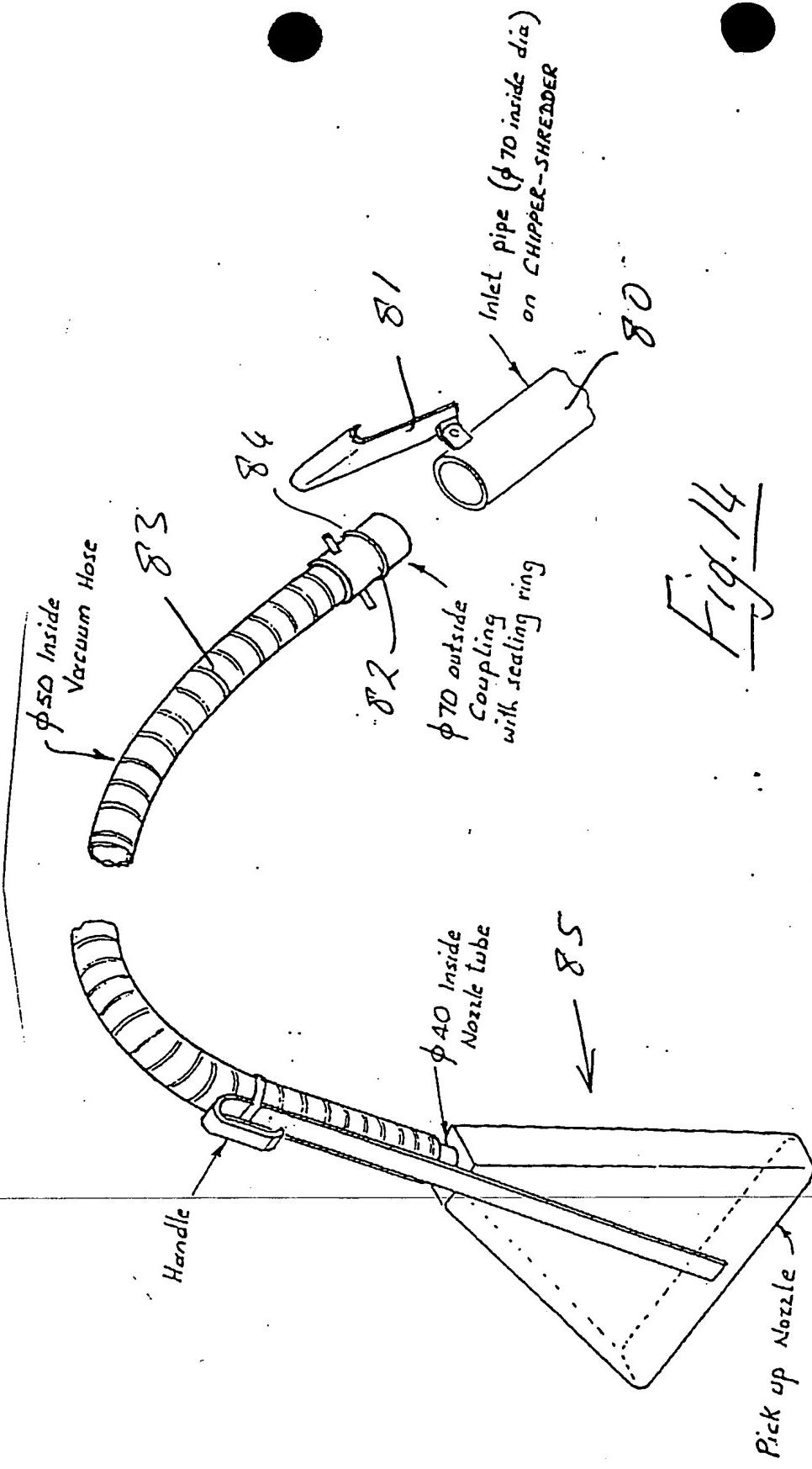


Fig. 14

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